

PCMH independent study

Four measures:

1. Blood pressure control among adults with diagnosed hypertension.
2. Control of A1C levels in adults diagnosed with diabetes.
3. Screening for tobacco use and tobacco cessation counseling for adults.
4. Age-appropriate immunization for children.

Benefits of blood pressure control —

In large-scale randomized trials with analysis of about 50,000 patients, antihypertensive therapy produces a nearly 50 percent relative risk reduction in the incidence of heart failure, a 30 to 40 percent relative risk reduction in stroke, and a 20 to 25 percent relative risk reduction in myocardial infarction.

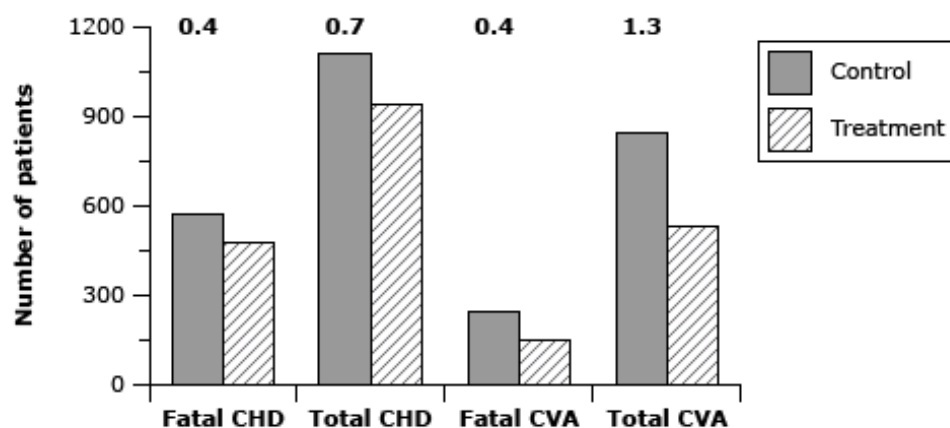
These relative risk reductions correspond to the following absolute benefits:

antihypertensive therapy for four to five years prevents a coronary event in 0.7 percent of patients and a cerebrovascular event in 1.3 percent of patients for a total absolute benefit of approximately **2 percent** (figure 6). **Thus, 100 patients**

must be treated for four to five years to prevent a complication in two patients. It is presumed that these statistics **underestimate** the true benefit of treating stage 1 hypertension since these data were derived from trials of relatively short duration (five to seven years); this may be insufficient to determine the efficacy of antihypertensive therapy on longer-term diseases such as atherosclerosis and heart failure. Equal if not greater relative risk reductions have been demonstrated with antihypertensive treatment of older hypertensive patients (over age 65 years), most of whom have isolated systolic hypertension. Because advanced age is associated with higher overall cardiovascular risk, even modest and relatively short-term reductions in blood pressure may provide absolute benefits that are greater than that observed in younger patients.

The benefits of antihypertensive therapy are less clear and more controversial in patients who have mild hypertension and no preexisting cardiovascular disease, and in elderly patients who are frail.

Cardiovascular benefit of treating mild hypertension



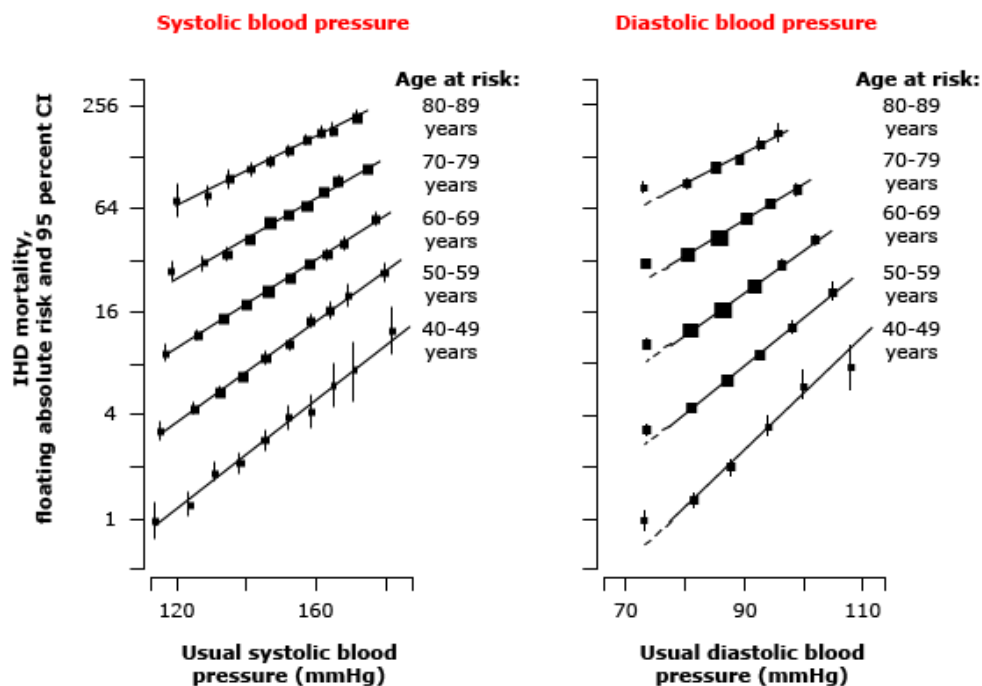
Reduced incidence of fatal and total coronary heart disease (CHD) events and strokes following antihypertensive therapy in 17 controlled studies involving almost 48,000 patients with mild to moderate hypertension. The number of patients having each of these events is depicted, with active treatment lowering the incidence of coronary events by 16 percent and stroke by 40 percent. However, the absolute benefit – as shown, in percent, by the numbers at the top of the graph – was much less. Treatment for approximately four to five years prevented a coronary event or a stroke in 2 percent of patients ($0.7 + 1.3$), including prevention of death in 0.8 percent.

CVA: cerebrovascular accident (stroke).

Data from: Hebert PR, Moser M, Mayer J, et al. Recent evidence on drug therapy of mild to moderate hypertension and decreased risk of coronary heart disease. *Arch Intern Med* 1993; 153:578.

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Coronary heart disease mortality related to blood pressure and age

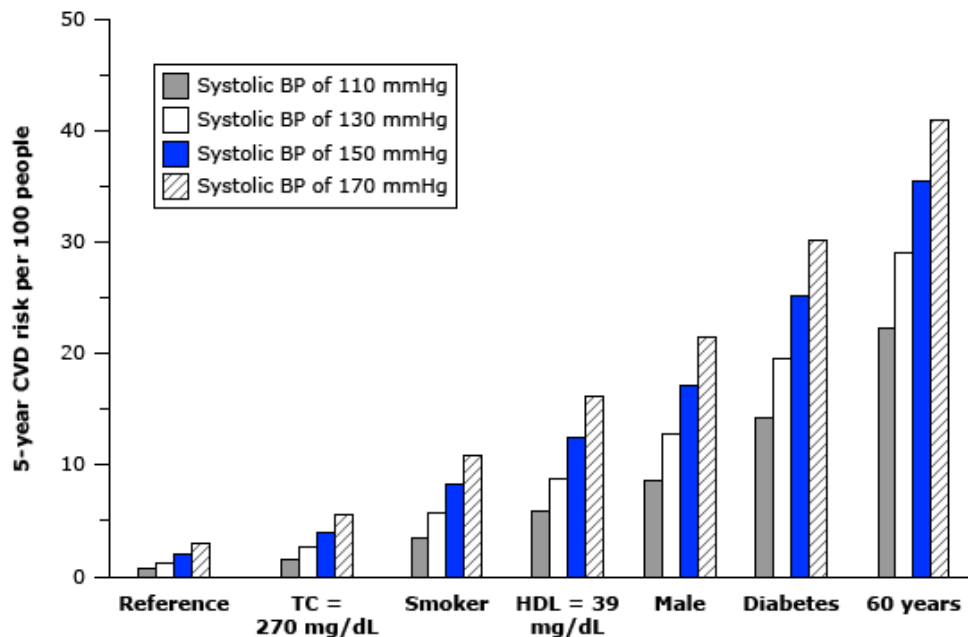


Coronary heart disease (CHD) mortality rate, pictured on a log scale with 95 percent confidence intervals (CI), in each decade of age in relation to the estimated usual systolic and diastolic blood pressure at the start of that decade. CHD mortality increases with both higher pressures and older ages. For diastolic pressure, each age-specific regression line ignores the left-hand point (ie, at slightly less than 75 mmHg) for which the risk lies significantly above the fitted regression line (as indicated by the broken line below 75 mmHg).

Data from: Prospective Studies Collaboration, *Lancet* 2002; 360:1903.

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Additive effects of risk factors on cardiovascular disease at five years



Cumulative absolute risk of CVD at five years according to systolic blood pressure and specified levels of other risk factors. The reference category is a nondiabetic, nonsmoking 50-year-old woman with a serum TC of 154 mg/dL (4.0 mmol/L) and HDL-cholesterol of 62 mg/dL (1.6 mmol/L). The CVD risks are given for systolic blood pressure levels of 110, 130, 150, and 170 mmHg. In the other categories, the additional risk factors are added consecutively. As an example, the diabetes category is a 50-year-old diabetic man who is a smoker and has a TC of 270 mg/dL (7 mmol/L) and HDL-cholesterol of 39 mg/dL (1 mmol/L).

BP: blood pressure; CVD: cardiovascular disease; TC: total cholesterol.

Adapted from: Jackson R, Lawes CM, Bennett DA, et al. *Lancet* 2005; 365:434.

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Diabetic control. This measure only captures POOR control.

The estimated overall prevalence of diabetes among adults in the United States ranges from 5.8 to 12.9 percent (median 8.4 percent) . However, because of the associated microvascular and macrovascular disease, diabetes accounts for almost 14 percent of United States health care expenditures, at least one-half of which are related to complications such as myocardial infarction (MI), stroke, end-stage renal disease, retinopathy, and foot ulcers.

All forms of diabetes increase the risk of long-term complications. These typically develop after many years , but may be the first symptom in those who have otherwise not received a diagnosis before that time.

The major long-term complications relate to damage to blood vessels. Diabetes doubles the risk of cardiovascular disease and about 75% of deaths in diabetics are due to coronary artery disease. Other "macrovascular" diseases are stroke, and peripheral vascular disease.

The primary complications of diabetes due to damage in small blood vessels include damage to the eyes, kidneys, and nerves. Damage to the eyes, known as diabetic retinopathy, is caused by damage to the blood vessels in the retina of the eye, and can result in gradual vision loss and blindness. Damage to the kidneys, known as diabetic nephropathy, can lead to tissue scarring, urine protein loss, and eventually chronic kidney disease, sometimes requiring dialysis or kidney transplant. Damage to the nerves of the body, known as diabetic neuropathy, is the most common complication of diabetes. The symptoms can include numbness, tingling, pain, and altered pain sensation, which can lead to damage to the skin. Diabetes-related foot problems (such as diabetic foot ulcers) may occur, and can be difficult to treat, occasionally requiring amputation. Additionally, proximal diabetic neuropathy causes painful muscle wasting and weakness.

Monitoring and target A1C — Glycated hemoglobin (A1C) goals in patients with diabetes should be tailored to the individual, balancing the demonstrated benefits with regard to prevention and delay in microvascular complications with the risk of hypoglycemia. A reasonable goal of therapy might be an A1C value of ≤ 7.0 percent for most patients (using an assay aligned to the Diabetes Control and Complications Trial [DCCT] in which the upper limit of normal is 6.0 percent).

Prospective, randomized clinical trials such as the DCCT, the United Kingdom Prospective Diabetes Study (UKPDS), and the Kumamoto Study have demonstrated that intensive therapy aimed at lower levels of glycemia results in decreased rates of retinopathy, nephropathy, and neuropathy. Every 1 percent drop in A1C was associated with improved outcomes and there was no threshold effect. These benefits have to be weighed against an increased risk of severe hypoglycemia associated with intensive therapy (particularly in type 1 diabetes). Although the goal of the intensive interventions in these studies was

normoglycemia, with an A1C less than 6.1 percent, the average A1C achieved in the intensive therapy groups of these trials was around 7 percent.

Example of Number Needed to Treat.

Good glycemic control with metformin may reduce overall mortality in obese patients with type 2 diabetes (number need to treat [NNT] = 14 for 10 years), and improved blood pressure control reduced diabetes-related mortality (NNT = 15 for 10 years); improved glycemic control with agents other than metformin, or with combinations including metformin, does not reduce diabetes-related or overall mortality. Major cardiovascular events (CVE) in type 2 diabetes can be prevented by control of blood pressure with low-dose diuretics, atenolol, or angiotensin-converting enzyme inhibitors (NNT = 10 to 20 for 5 to 10 years for primary prevention of one CVE); by use of aspirin (NNT = 45 for 5 years for primary prevention of one CVE); and by use of simvastatin to lower low-density lipoprotein (LDL) cholesterol (NNT = 6 for 5 years for secondary prevention of one CVE). Glycemic control (NNT = 19 for 10 years) and hypertension control (NNT = 6 for 10 years) slow the progression of complications in patients with type 2 diabetes. Retinopathy and nephropathy are more preventable than neuropathy. The benefits of glycemic control are less for patients with shorter life expectancy and are greater for those with the highest levels of Hb A1c because larger Hb A1c improvements can be achieved in such patients. Periodic screening of patients for eye, kidney, and foot complications is supported because effective early treatment of these complications is available.